TOPOGRAM FROM A SPIRAL RECONSTRUCTION

PRIORITY STATEMENT

The present application hereby claims priority under 35 U.S.C. §119 to German patent application number DE 10 2013 200 337.4 filed Jan. 11, 2013, the entire contents of which are hereby incorporated herein by reference.

FIELD

At least one embodiment of the invention generally relates to a method and/or a computed tomography system for establishing a topogram, and/or to a computer program product.

BACKGROUND

Computed tomography is an imaging method used primarily for medical diagnosis. If a spatial three-dimensional image, or 3D image for short, of an examination region is to be acquired using computed tomography, the acquisition unit of a computed tomography system rotates about the examination region. The acquisition unit comprises an x-ray source and an x-ray detector. A projection is acquired at each of the different positions of the acquisition unit on its circular path. The different projections are acquired at different projection angles in this process. A projection angle in the following refers to a radial angle of the acquisition unit in its rotation plane; thus for example the angle formed by an x-ray source/x-ray detector connecting axis with a fixed axis parallel to the rotation plane. At the end of the series of acquisitions the projections are reconstructed to produce a 3D image.

The examination region is typically a defined body region of a patient. The examination region must be isolated before a high-resolution 3D image is acquired, to keep radiation exposure due to the plurality of projections as low as possible for the patient. To plan the acquisition of a high-resolution 3D image, an overview acquisition is produced in the form of a so-called topogram. The topogram is also used to determine the attenuation properties of the x-ray beams through the examination region, as the attenuation properties are used for the further determination of acquisition parameters for dose modulation during a further, in particular diagnostic, acquisition.

A conventional topogram is generally acquired in such a manner that the acquisition unit does not rotate and therefore only projections at a fixed projection angle are acquired. This means however that the rotational movement of the inner, rotatable part of the gantry, in which the x-ray source and x-ray detector are incorporated, must be slowed down. This slowing process generally takes 30 to 40 seconds and therefore represents a considerable delay in the clinical workflow. This delay can have serious consequences, in particular for patients suffering polytrauma after an accident.

Alternatively, a topogram can also be acquired in spiral mode, in that the inner part of the gantry rotates as for the acquisition of a high-resolution 3D image but the x-ray source operates in pulsed mode. Pulsed mode here means that the x-ray source only emits x-ray beams at a defined projection angle so that only projections. from a defined direction are acquired. This produces a "spiral topogram" which, like a conventional topogram, has a defined projection direction, for example anterior-posterior or lateral, for a patient. However the precise activation of the x-ray source proves difficult, so the x-ray source often also emits x-ray radiation when it is not required for the acquisition of a projection. This means that a higher dose is applied than is necessary for the acquisition of a topogram.

The acquisition of an individual topogram also only allows an overview at a defined projection angle, for example with anterior-posterior or lateral alignment in the case of a patient. In the case of a computed tomography system with just one x-ray source the acquisition of a second topogram at a different projection angle takes more time and also results in a higher dose for the patient. However it is important for dose modulation for a further acquisition after the topogram that the attenuation of the x-ray beams by the patient is determined along two body axes. In fact the attenuation properties of the examination region or of the patient are often estimated from just one topogram assuming an elliptical body cross section. This procedure is bound to be inaccurate and can therefore result in a higher dose being applied or poorer image quality than desired.

The projections for the cited methods for acquiring a topogram are central projections, as the x-ray beams spread in the shape of a fan or cone beam. The projection center here is the point at which the x-ray radiation is emitted by the x-ray source. This means that with the known methods for acquiring a topogram only central projections at a defined projection angle are acquired. There can therefore be no compensation for the distortions that occur with central projections, so the topograms resulting from the known methods have distortions.

SUMMARY

At least one embodiment of the invention provides a distortion-free topogram.

At least one embodiment of the invention is directed to a method, a computer program product, and/or a computed tomography system.

Embodiments of the invention are described below with respect to an apparatus and also with respect to a method. Features, advantages or alternative embodiments described here can also be applied to the other claimed subject matter and vice versa. In other words the object-related claims (which are directed at an arrangement for example) can also be developed using the features described or claimed in conjunction with a method. The corresponding functional features of the method here are formed by corresponding object-related modules.

At least one embodiment of the invention is based on a spiral acquisition of an examination region using a computed tomography system. At least one embodiment of the invention is based on the idea of using such a spiral acquisition to reconstruct a 3D image of the examination region and also of establishing a topogram of the examination region by parallel projection of the image along a projection direction. At least one embodiment of the invention allows the acquisition of a distortion-free topogram, as a reconstructed 3D image can simply be projected in a parallel manner along a projection direction. At least one embodiment of the invention also allows particularly fast acquisition of a topogram, in particular in the clinical environment, as the rotatable part of the gantry does not have to be stopped for the spiral acquisition.

In a further embodiment the invention comprises a computer program product with program code segments to execute the inventive method, when the computer program product is executed on a computer. This allows the individual steps of the method to be executed in a fast, identically repeatable and robust manner.